



National Report Presented to
the International Cartographic Association's
14th General Assembly 2007
Moscow, Russia,
by the Swedish Cartographic Society

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Introduction

The national report of Sweden is written by the Swedish Cartographic Society. The beneficiaries are the delegates of the General Assembly 2007 of the International Cartographic Association in Moscow, Russia.

In Sweden, maps and geographic data are produced by national and local government authorities and institutions, commercial enterprises, scientific institutions, organisations, and individuals. This report focus on cartographic production of map and map series, use of maps and geographic information.

The Swedish Cartographic Society

Background

The Swedish Cartographic Society was founded in 1908, and is most probably one of the oldest of its kind. The Society's goal is to increase the interest in cartography and other topics related to mapping or the use of maps in Sweden and to try to encourage a development in the area.

The one hundred jubilee in 2008 is planned to become a major event that year. The Society has announced the year 2008 as the Year of the Map (see www.kartansar.se). The purpose is to increase understanding and use of maps in Sweden. All map producers and users are expected to take part in this celebration.

The Society is organised in six sections; Cartography, Historical maps, Geographical Information Systems, Photogrammetry and Remote Sensing, Geodesy and Education. Each section has responsibility for its respective disciplines and among other things the sections arrange seminars, exhibitions and study visits.

A main activity of the Society is to organise the annual conference “Map days” (see www.kartdagar.se). The conference is arranged in combination with a trade show that presents products and services from more than 50 companies and authorities. The conference program includes seminars within the areas of Cartography, Historical maps, Geographic Information Systems, Photogrammetry, Visualisation, Geographic Information Technology, Remote Sensing, and Geodesy. The conference also includes a map exhibition, seminars on educations, management,

pricing, politics and strategies. Social arrangements are an important part of the conference. In 2007 more than 1,000 individuals took part in the “Map days”.

Four times a year the Society publishes the cartographic journal “Mapping and Image Science”. One issue a year is focussed on scientific matters. During the last years the number of members in the Society have been about the same. In 2007, the amount of members is some 2,500. Our members are professionals, students, retired, and individuals with a common interest for maps. About one hundred of these are members from abroad. Anyone who wants is accepted as a member of the Society. The annual fee is SEK 150, SEK 100 for retired, and SEK 50 for students.

Committee board

The committee board consists of a president, a vice president, a secretary, a treasurer, seven members, and two deputies. In 2007 the president is PhD Patrik Ottoson and the secretary is Övlt Lennart Bergh

The Society and its six sections are governed by the rules of the Society. The Swedish Cartographic Society represents Sweden in the International Cartographic Association (ICA), and has participated in the General Assemblies of Delegates in Paris 1961, in London and Edinburgh 1964, in New Delhi 1968, in Montreal and Ottawa 1972, in Moscow 1976, in Tokyo 1980, in Perth 1983, in Morelia 1987, in Bournemouth 1991, in Barcelona 1995, in Ottawa 1999, in Durban 2003, and in La Coruña 2005.

The Society will also be represented at the 14th General Assembly in Moscow, Russia 2007. Delegates to this assembly will be PhD Patrik Ottoson and Övlt Lennart Bergh.

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The Historical Section

The Historical Section of the Swedish Cartographic Society consists of a board of four persons, whose main duties are to arrange a session at the annual conference “Kartdagarna” and to acquire papers to the society journal “Kart & Bildteknik”. In addition, study visits and excursions are arranged, and occasionally more extensive events like the 1992 three-day course in early mapping techniques which included hands-on practice in plane-table surveying.

Study visits have gone to such obvious sites as the National and the Military Archives and to the Royal Library map exhibition 2006, but also to map repositories in the Royal Palace Archives, the Bernadotte Library, the Skokloster Palace and the Fire Insurance Company which was founded in 1782 and preserves a considerable collection of estate maps and building plans. Excursions might cover such themes as the transition from rural to urban settlement in the Stockholm area in connection with the Cadastral Map project run by the Royal Swedish Academy of Letters, History and Antiquities.

Conference papers tend to be either on the history of cartography proper or on the use of “historic” maps as sources for research within quite diverse fields, from plant genetics and the history of hop cultivation to the history of river logging or minority languages. The current project on Sweden’s unique heritage of early cadastral maps is frequently being reported. Conference papers are the main source for journal contributions, but shorter notices from other sources do appear also.

Section members regularly attend the biannual conferences on the history of cartography (IHC, next time in Bern July 2007), but only rarely the ICA conferences.

Former section chairperson Ulla Ehrensvärd is still the leading Swedish figure in the field with her recently published “The history of the Nordic map: from myths to reality” and as the regional editor for the Chicago-based “History of cartography” project.

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Students’ maps are exhibited during the Map Exhibition in Kartdagarna.

The Cartographic Section

The Cartographic Section of the Swedish Cartographic Society consists of a board of four members, whose main duties are to arrange sessions, map exhibitions and a thematic quiz at the technical exhibition for the annual conference “Kartdagarna”. An introductory course in map production has been held during the conference. The section also acquires papers or proposals of papers to the society journal “Kart & Bildteknik”. In addition, study visits are occasionally arranged.

One member of the section is now editor of the jubilee book that will document the work of the Cartographic Society over the last 100 years. This national report for the ICA is taken care of by another member and the web site by a third member. Members regularly attend the ICA conferences and the section is responsible for the Swedish contribution to the International Map Exhibition and to the Barbara Petchenik competition for children at the ICC.

The Map of the Year 2007 was a combined chart and orienteering map from Blekinge in Southern Sweden.





One of the childrens' maps that will be sent to Barbara Petchenik Award in Moscow 2007.

The Cartographic Section puts great emphasis on encouraging education in cartography and making people aware of and more interested in maps. Education in cartography is very limited in Sweden, despite the fact that more and more maps are being used in the different media – newspapers, TV and internet etc. Maps are an ideal method of graphic presentation and indispensable to the media. There is a need to help the public get the most out of these maps and other graphic presentations. Web cartography will in the future become an important area of interest. As a step in this direction, the Swedish Cartographic Society has financially supported the publication of a school book in cartography.

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The Section of Geodesy

The education of surveyors and GIS engineers has changed a lot the last 20 years. New places of education have been established and allow increased possibilities to recruit surveyors throughout the country. The conditions of educating sur-

veyors, geodesists and GIS engineers at the level of Master of Engineering have not changed in the same propitious way and the result is a decreasing number of candidates. It is a very alarming and negative trend in the present situation when so much is developing in the sector. The Swedish Cartographic Society is conscious of the problem and supports efforts in trying to turn this negative trend and create a debate about it. During the last few years the Cartographic Society has altered the program at the annual conferences (Kartdagarna) to be more a kind of education opportunity instead of just a traditional conference. For a few years now the geodetic sector of the association has focused principally on subjects related to geodetic reference system and GPS.

Recently, GPS surveying has, in many cases or perhaps most cases, replaced traditional terrestrial measuring. Static surveying using GPS has become a common tool in many organisations. In Sweden there are by now several hundred users of RTK based on own reference stations or RTK based on the National Land Survey Network-RTK service, named SWEPOS. Hence, satellite based positioning with centimetre accuracy is becoming more and more common. For efficient geodetic surveying and processing of survey data many users are in need of an unambiguous and stable geodetic reference system. Then, using Network-RTK based on SWEPOS there is also a need to have access to GSM and there is still a problem in some areas of not having access to continuous signals. More often the operator (the user of the surveying tool) has the surveying tool integrated in the general working tool, e.g. the excavator or the road grader and staking out as preparation for construction is no longer necessary. Information, such as drawings, maps or other geographical or numerical information is stored digital instead and presented graphically on screen and integrated with the positioning system. Hence, the need for a surveying engineer is reduced and his duty is taken care of instead by the excavator or any other operator, in most cases without specialist surveying knowledge. Consequently, the measurements need to be done unambiguously (e.g. without any alternative solutions) and with great reliability.

The three-dimensional and globally adjusted Swedish geodetic reference system SWEREF 99 replaces more often the old two dimensional RT 90 as well as local systems being used by municipalities. In addition, a new geoidal model combined with a new height system makes it possible to use GPS for reasonably accurate height measurements. This will hopefully lead to a uniform reference system for all kinds of applications in the country.

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The Educational Section

Many factors have influenced the current situation for companies, authorities and organizations to recruit personnel with educated cartographical and related skills. Two examples are new technology and shortage of educated people. Therefore, a new section for educational matters was formed in the Swedish Cartographic Society. The aims of the educational section include working with educational matters on all levels, both nationally and internationally, and act for increased competence development in cartography and related fields in Sweden. Among the activities is an annual conference for lecturers and others where educational matters are treated.

Cartography has long standing traditions in Sweden. Maps are widely spread throughout society and their use is to some extent taught already in primary school. For example, maps are used in many outdoor activities and sports, like hiking, orienteering and rally. Many of the activities have their origin or strong roots in Sweden or Scandinavia at large. However, despite the widespread use of maps, there has never been a chair in the subject at any of the Swedish universities. Cartography is taught at several Swedish universities. A survey including the 61 universities in Sweden showed that 24 of them give courses containing elements of cartography. Among these, there are nine universities which provide courses where the main focus is on cartography (Table 1).

There are also a number of courses where cartography makes up a major part of the total course content (Table 2).

As can be seen from the tables, courses focusing on cartography only are relatively few. However, many universities give courses in earth science, geography, geoinformatics and geomatics that contain elements of cartography. These are, in addition to the universities mentioned above: Chalmers University of Technology, Göteborg University, Jönköping University, Linköping University, Lund University, Malmö University, Mid Sweden University, Mälardalen University,

University	Course name	ECTS	Level
Blekinge Institute of Technology	Computer assisted cartography and presentation	7.5	A
Gotland University	The map I – History of cartography	7.5	A
Karlstad University	Cartography I	7.5	A
	Cartography II	7.5	B
Luleå University of Technology	Cartographic visualization	7.5	A
Royal Institute of Technology	Visualisation techniques	7.5	C
Stockholm University	Cartography and map production	15.0	B
Umeå University	Cartography	7.5	A
University of Gävle	Applied cartography	7.5	A
	Cartography I	7.5	A
	Cartography II	7.5	B
University West	Cartographic visualisation	7.5	A

Table 1. Courses in cartography at the Swedish universities. 7.5 ECTS represents work effort equal to 5 weeks full time studies. A is basic level, B is intermediate level, and C is advanced level on first cycle education (usually Bachelor's programmes).

University	Course name	ECTS	Level
Gotland University	Cartography and geographic information systems	7.5	A
Högskolan Dalarna	Cartography and Geographic Information Systems	7.5	A
Royal Institute of Technology	Web-GIS	7.5	D
Stockholm University	Geographical Information Systems and Cartography	7.5	A
University of Skövde	Geographical Databases and Cartography	7.5	A

Table 2. Courses where cartography constitutes a major part of the total course content at the Swedish universities. 7.5 ECTS represents work effort equal to 5 weeks full time studies. A is basic level on first cycle education (usually Bachelor's programmes) and D is level given on second cycle educational (usually Master's programmes).

Swedish University of Agricultural Sciences, Södertörn University College, University of Kalmar, Uppsala University, and Växjö University.

It should be noted that courses with closely related content, such as map projections or web mapping, have been excluded from this study, since they are more appropriately described as courses in geodesy or application development or programming. Also, there are a few non-university programmes, funded by the Swedish Agency for Advanced Vocational Education, that include basic courses in cartography. Furthermore, practically all introductory university courses on geographical information systems (GIS) include some cartographical issues. A survey over the GIS courses given in Sweden was carried out by Brandt et al. (2006).

Although there are both undergraduate and graduate programmes that include cartography courses, no programme explicitly educates cartographers. However, it is often possible to write a thesis or conduct PhD studies in earth science, geography, geoinformatics or geomatics where the focus is on cartography. It must be pointed out that e.g. a geomatics programme can be very similar to cartographic programmes abroad.

With the introduction of GIS, there has been a general trend of decreasing cartographic skills of students and high-quality maps are getting scarcer. The students have moved from drawing maps by hand to create them in the computer. This has reduced their skills and cartographical understanding, since the software used has limitations in respect to variations of possible symbols, colours, etc. Another reason is that more time is spent on how to use the GIS, whereas earlier, more time was spent on cartographical issues. A survey by Elg (2004) looked into this problem. She concluded that this was indeed the case, but also found that some universities have realised the problem and are trying to include the cartographic training in the more computer-technical GIS courses.

References

- Brandt, S.A., Karlsson, J.M. and Ollert-Hallqvist, P., 2006, Harmonization of GI educations in Sweden and the Bologna process – viewpoints of University of Gävle. In: Proceedings of the Fifth European GIS Education Seminar (EUGISES 2006). September 7–10, 2006, Cracow-Pieniny, Poland.
- Elg, M., 2004, En enkät om kartografiutbildning. Kart & Bildteknik (Mapping and Image Science), Vol. 19(3), pp. 18–20. In Swedish.

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Sweden's County Administrative Boards

Organisation

Sweden is divided into 21 counties, each of which has its own County Administrative Board ("Länsstyrelsen") and County Governor.

The function of the County Administrative Boards is to be a representative of the state in their respective counties, and serve as a link between the inhabitants, the municipal authorities, the Central Government, the Swedish Parliament and the central state authorities.

GIS/GIT Activities

Maps and databases are frequently used in many of the legislative tasks, such as permits or recommendations for a proposed expansion of some exploitation request etc., in the day-to-day work carried out by officers at the County.

The County Administrative Boards are both data consumers and data producers. In the day-to-day work officers make extensive use of background data from National Land Survey, the Geological Survey of Sweden, the Swedish Maritime Administration, Swedish Meteorological and Hydrological Institute and many other data providers. Internally produced data, such as various protected areas, are also used in large extent.

Internally produced data are freely distributed throughout service platform "LstGIS" (www.gis.lst.se). Some characteristics of LstGIS service platform include:

Over 1 500 GIS-related layers uploaded and provided by each County (www.gis.lst.se/lstgis)

Over 20 harmonized layers with national coverage (www.gis.lst.se/lstgis/lstsverige). These layers are also provided as OGC WMS WebMapServices (www.gis.lst.se/lstgis/wms.asp)

Approx. *10 GeoServices* in application fields such as WindEnergy, Environment, Crisis Management and Oil Spill recovery Atlas. Some of these webGIS-applications are public, others are password protected.

Metadata are provided using core components from ISO19115.

LstGIS service platform, start page

Adress <http://gis.lst.se/>

Publika tjänster: [Sveriges Länkartor](#) [GISdata från Länsstyrelserna](#) [Indelningskartan](#) [VindGIS](#) [WMS WebMapServices](#)
Samverkans-tjänster (öppenord-skyddade): [Mikaren](#) [Mikrodata](#) [Vattenbrukare](#) [Eggsnadsinventering](#) [Vattenkartan](#)
Regionala tjänster: [ServiceData Syd](#) [Sjökartan](#) [Informationskartan](#) [Västra Gotaland](#) [EU Miljökartan](#)

Nyheter:
WMS-tjänster
SWEREF99TM-konvertering
(april 2007)

Rapporter:
[LstGIS tjänsteplattform](#)
[Lst metadatastandard](#)
[Harmonisering av Lst GISdata](#)

Länsstyrelserna
Web Map Services
[Web Map Services](#) Länsstyrelserna har ett antal publika WMS-er för desktopGIS och andra klienter som stödjer OGC WMS version 1.1.1. Vidare finns en [fristående WMS-klient](#) (viewer). Introducerades april 2007.

Sveriges Länkartor
Skyddad natur, kommun- och tätortsbeskrivningar, sevärdheter (vilka kan uppdateras av respektive länsstyrelse kontinuerligt). Automatiskt val av skärmpåskning (=större karta) och punktsymboler för nationalpark, naturreservat och djur- och växtskyddsområde. **Nu med SWEREF99TM-konvertering**. Introducerades dec 2001 (ArcIMS kartmotor).

GISdata från Länsstyrelserna
Förhandsgranska på karta inklusive tillhörande tabelldata. Introducerades okt 2001.

LstGIS Indelningskartan
Kartredovisning av den regionala indelningen för ett antal statliga myndigheter och kommunindelningen. Primärt utvecklad för introduktionsutbildning inom länsstyrelserna. Introducerades apr 2005.

StrateGIS Utbildningstittskåp Sverige (ArcIMS kartmotor) introducerades i maj 2001 och stängdes i december 2003. Likartad funktionalitet finns i Sveriges Länkartor. [Utbildningsprojektet finns dokumenterat](#)

PilotGIS datadistribution introducerades i januari 1997 och stängdes i september 2001. Ersätts med "GISdata från Länsstyrelserna". För info om pilotGIS-projektet, kontakta [Boverket](#)

/2007-04-25/
[Om cookies på www.gis.lst.se](#)
[Om XP SP2 popup-blockerare](#)

Mats.oberg@do.lst.se /May 2007

LstGis service platforms where you can find the different organisations involved.

Example of GeoService "Sveriges Länkartor" (general environmental)

<http://www.gis.lst.se> - Länkartor - Microsoft Internet Explorer

Länkartor

Förstora/förminska kartbilden
Flytta kartan
Återgå till föregående kartbild
Visa hela länet
Tänka/slicka information i karta
Vad är "Förenklad kartbild"?
Visa information om det som syns
Söka efter objekt i ett lager
Skriva ut eller kopiera karta
Visa metadata för ett visst lager

Teckenförklaring **Uppdatera kartan**

Aktiv: **Naturreservat**

Synlig Aktiv

- ☒ Ortnamn
- ☐ Sevärdheter
- ☒ Tätortsbeskrivningar
- ☐ Anläggningar (CEMIR)
- ☒ **Skyddade områden**
 - ☐ Djur- och växtskyddsområden
 - ☐ Kulturresevat
 - ☐ Nationalparker
 - ☒ Naturreservat
- ☐ **Riksintressen**
- ☒ **Bakgrundskartor**
 - ☐ Förenklad kartbild
 - ☒ TONA NED BAKGRUND

SWEREF99: Syd/Nord-koordinat: 6399796
Väst/Öst-koordinat: 318375

WGS84 Latitud: 57° 42,215'
Longitud: 11° 57,109'

Väst/Öst:1279897, Syd/Nord:6395218

Internet

Mats.oberg@do.lst.se /May 2007

WMS-server URL [ArcIMS MapService server, service name]
http://www.gis.lst.se/wmsconnector/com.esri.wms.Esrimap/wms_skyddadeomraden? [http://gis.lst.se, wms_skyddadeomraden]
http://www.gis.lst.se/wmsconnector/com.esri.wms.Esrimap/wms_riksintressen1? [http://gis.lst.se, wms_riksintressen1]
http://www.gis.lst.se/wmsconnector/com.esri.wms.Esrimap/wms_riksintressen2? [http://gis.lst.se, wms_riksintressen2]
http://www.gis.lst.se/wmsconnector/com.esri.wms.Esrimap/wms_vindgis1? [http://gis.lst.se, wms_vindgis1]
--- [http://gis.lst.se, ms_natpark_natres_1]

The LstGIS service platforms conforms to a large extent to the demands on Network Service outlined in the INSPIRE directive.

Recent technical development includes:

- XML-based metadata. The Planning Portal-project can be viewed as a pre-test/forerunner to the national SDI.

- Address

The Local Authorities

The 290 local authorities in Sweden have a well-developed self-governance and are by constitution, autonomic. To perform their tasks, geographical data and maps are used in several ways. There is a considerable need for different maps in a variety of activities and operations.

The role of the local authorities in providing

basic large-scale geographic data becomes more important as its usage increases in a lot of old and new applications, where GIS offers good support. There is also municipal co-operation within regions as well as between the municipalities and the state, in order to provide society with quality controlled geographic data. Most local authorities produce and update geographical databases or maps within their organisation. In most cases, the organisations responsible belong to the town planning committee. Other local authorities purchase the service from commercial companies, and some perform the task in co-operation with other local authorities.

There are 850 000 people employed in the local authorities, which is equivalent to a fourth of the total sum of the employed part of the population.

Co-operation

Most authorities have formed a group for the most frequent internal and external users of maps and GIS data. These groups usually deal with matters of co-operation, technical development and financing.

There is an extensive co-operation between the Swedish Association of Local Authorities and Regions (SALAR) and Lantmäteriet (the Swedish National Land Survey) concerning e.g. collaboration in constructing national databases. A framework agreement on this matter was drawn up in 2001 and has been renegotiated every third year in order to include more data at higher quality in exchange for higher economic compensation. The co-operation concerns addresses, buildings, other topographic objects and cadastral index maps, among other matters. Normative agreements have also been developed that the local authorities may use as a base, while making their individual agreements with Lantmäteriet. There is a similar set of agreements with Vägverket (the Swedish National Road Administration) concerning the road network.

SALAR and Lantmäteriet have developed a common vision for the future co-operation concerning geographic information and cadastral activities. In order to obtain a more efficient Swedish SDI, the vision submits a network-based collaboration for exchange of data in society. The vision describes geographic information as a part of e-government. The same concept was adopted in the National Geodata Strategy produced by Geodatarådet (the high level advisory board) at Lantmäteriet, in which the local authorities are represented.

Co-operation is becoming more and more common. In order to offer map-users harmonious and highly accurate county-covering data, the local authorities in several counties work together

with harmonious geographic databases covering the cities. In some regions, Lantmäteriet fills the gaps between the urban areas. The most frequent users are the transport sector, emergency and rescue services and the police force.

“SAM-project”, (“the Coop-project”) is an informal organisation financed by individual local authorities, Regional Associations of Local Authorities and SALAR. Nearly half of the municipalities contribute financially to the project. The project aims to provide good, basic support to the municipalities within the field of geographic information. The project provides advisory reports and seminars for co-operation, agreements, working processes etc.

Development

E-government has received an introduction into all sorts of activities within the local authorities and the applications increase rapidly. Development of GIS-applications as e-services is constantly in progress. The issue of national specifications of requirements for common functionalities for adoption in various administrations is at present in focus. Also, the discussion of creating a national role-based system for electronic identification is of immediate interest for the municipal administrations.

The GIS-technology has been adopted within most municipalities. Considerable efforts are made while transforming data from CAD-systems, to data suitable for the state-of-the-art GIS-systems.

It is obvious that there are difficulties in spreading GIS technology outside the mapping organisation to other administrations such as schools, social services, and health care. Hinders may consist of poor resources, non-structured datasets, or pedagogical difficulties. Many local authorities have employed a GIS controller in order to stimulate the use of GIS in all sorts of activities within the organisation.

Today the GPS technology is commonly used. Aerial photography, digital aerial images, orthophotos and photogrammetric mapping are often purchased at intervals of several years. Nearly 10 of the 290 municipalities have their own digital photogrammetric software for collecting data from aerial images. As a complementary way of assembling data, some local authorities have adopted the method of laser scanning. This method generates digital terrain models as well as digital surface models at a reasonable cost. Altitude data are used, for example, for three-dimensional city models and for production of orthophotos.

In order to give a high-quality picture of proposals on spatial planning and infrastructure, some

local authorities, have utilised the technology of Virtual Reality. Others are on their way to transforming their data into three dimensions for the purpose of visualising the urban environment in a more natural manner. To facilitate the processes of planning and building permit, oblique aerial imaging systems have been introduced in the largest municipalities.

The GPS-based Network-RTK (Real Time Kinematics) technique has step-by-step been introduced in Sweden. The technique has proved to be an economically advantageous method of determining positioning with a high degree of accuracy. RTK will be established over all inhabited areas of Sweden during 2007. The project is a co-operation between Lantmäteriet, other central governments and local authorities within the regions.

The changeover to SWEREF 99 and RH 2000, which are the Swedish realizations of the European reference systems ETRS 89 and EURS, is in progress within the municipalities. About fifteen municipalities have completed the transition to SWEREF 99 and in another hundred, work proceeds actively. Concerning RH 2000, corresponding figures are five completed respectively 50 actively working.

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Lantmäteriet (The National Land Survey of Sweden)

Lantmäteriet (National Land Survey of Sweden) is responsible for the production of the national map series and geographic databases and is also undertaking a good deal of cartographic work and GIS consulting on repayment basis.

Organisation

The National Land Survey of Sweden, originating from 1628, is a Government agency under the Ministry of the Environment. The mission is to give support for creating an efficient and sustainable use of Sweden's real property, land and water. The organisation has three main activities, which also form the organisational structure: Cadastral services, Land and Geographic Information Services, and Metria, which wholly is working on a competitive, commercial basis. Support

for these activities is provided by corporate functions. Swedesurvey is the overseas agency of the National Land Survey of Sweden.

The total staff amounts to 2,000. The headquarter is situated in Gävle. The annual turnover is approximately SEK 1,700 million. SEK 1,300 million are generated through fees and invoiced costs for real property formation, the use of information from databases and for consultancy services; core grants from Government amount to approximately SEK 400 million. Core grant financing is primarily used for producing basic data and managing and maintaining registers and databases.

Cadastral Services

The Cadastral services Division comprises 21 Cadastral authorities (one in each county) and, on the central level, one unit for development and one for management. Most of the Cadastral authorities also have local offices – in total there are 90 offices in the country.

The Cadastral authorities carry out cadastral procedure activities, and provide different types of services, which are closely linked to their official duties. The cadastral services comprise real property formation through formal cadastral survey and maintenance of the real property register. Common tasks are sub-division of land into plots for building houses and recreational homes and reallocation to ensure the availability of land for building roads, railways and public utilities.

At the central level the division of Cadastral services has the responsibility for the supervision of, and to give support to, the regional Cadastral authorities. The most important task is to support the real estate formation process. That includes law amendment, quality control, competence development, and development of techniques and methods in order to shortening the handling of cases and reduce the costs.

Land and Geographic Information Services

This activity, which mainly is carried out at the central office, comprises responsibility for collecting, administering and making available basic land-related data, geoinformation and information on Sweden's 3.2 million real properties. It includes basic geographical databanks, the series of official maps (printed and on CD), information from geodetic and aerial photo archives, the land data bank system, central registers of buildings, apartments and address as well as the credit market (mortgage) system.

The responsibility for all kinds of basic information services includes archives, registers, maps, databases produced by in-house and collaboration resources. This part of Lantmäteriet also holds basic competence for development in geodesy,

photogrammetry, cartography and geographic information systems.

Metria

Metria is the part of the organisation with resources for collection and customization of geographical and real property information, surveying computation, map production, geographic information systems and physical planning. Metria carries out its services on contract and operates in competition with other Swedish and international companies on the national market. Metria is also operating as a vendor and as a production and consultant enterprise in the growing remote sensing activities. Through KartCentrum, Metria is responsible for the publication of the national map series and other map products, as well as for a comprehensive cartographic activity on a contract basis. Metria's clients are to be found in both the private sector, such as forestry and telecom companies, and in the public sector.

Swedesurvey

The National Land Survey's overseas agency, Swedesurvey, is a governmental company that markets, co-ordinates and provides services in land administration and surveying throughout the world, often in the form of institutional co-operation.

Swedesurvey has been active on the international market since 1980 and has always aimed at providing high quality services based on the requirements of the customer. Swedesurvey's status as a Government company guarantees impartiality, reliability, quality consciousness and continuity. Swedesurvey has an annual turn over of approximately SEK 100 million and works in about 30 different countries every year.

General Comments on Cartographic Activities

The period 2003–2007 can be characterised by focus on:

- Production of maps and map-related services in new media, such as mobile phones, handheld computers, Internet-based services and GIS applications
- Development of the spatial data infrastructure
- Introduction of a wide range of Internet based services
- Introduction of satellite-based positioning system with centimetre accuracy
- Widened co-operation on the European and Global level
- Establishing of a new national geodetic reference system and a new national height system
- Introduction of a new map index system and accordingly, new map sheets for the national mapping series as a consequence of the new geodetic reference system

- A complete switch to digital sensors for the aerial photo production

Strategy for the Swedish SDI Development

The Swedish Government and Parliament has given Lantmäteriet – the National Land Survey of Sweden – an outspoken role as coordinator of the national spatial data infrastructure (SDI). The responsibility comprises coordination of production, cooperation, dissemination and research and development. The responsibility also includes coordination of the implementation of EC directives related to GI (such as INSPIRE and GMES).

Government has also decided to establish a high level advisory board (Geodatarådet) supporting Lantmäteriet in its coordination role. Furthermore, it has been decided to develop a national geo-data strategy covering all strategic issues related to the handling of geo-data in Sweden. Lantmäteriet is responsible to work out this strategy in close cooperation with the advisory board and other stakeholders. The strategy was presented by end of March 2007 and will then be annually updated.

The strategy is based on detailed investigations on user requirements and provides guidance for all players in the GI field in Sweden. Based on a common concept for the development of the Swedish SDI strategic goals are clearly identified and strategies for achieving the goals formulated.

It is expected that implementation of the strategically most important issues, both national and international, that are given emphasis in the strategy will take place following further work on the details of the action plans for the involved authorities and organisations. The strategic plan should, thus, be the basis for ensuring that such activities are carried out in a coordinated and efficient manner. A requirement is also that the strategic plan should provide the foundation for the coordination and preparatory work for budgetary and other decisions within the government and its offices

An important issue concerning the strategy is clarification of the Swedish position concerning the INSPIRE directive, the development of Global Monitoring of Environment and Security (GMES) and the implementation of the PSI directive for geodata.

The Strategy for the further development of a national infrastructure for Geodata is

to cooperate in a network as a basis for the infrastructure.

The strategic goal is to establish well functioning cooperation between independent organisations – supported by coordination activities, technical framework and explicit agreements.

to create a useful structure of the information.

The strategic goal is to meet basic needs concerning usability, interoperability (between different data themes, different application areas and across borders) and quality as well as accessibility. The specifications should be established based on a uniform Swedish framework and with full participation from the involved parties, such as other governmental agencies, municipalities and other organizations and enterprises

Lantmäteriet is responsible for setting up an organisation for management of the geodata specifications. Already today there exists a Swedish framework for standardisation of geographic information, which to a large extent is based on international standards (the ISO 19 100 series).

to develop a technical infrastructure which will meet future demands.

The strategic goal is to form a technical infrastructure supporting an efficient cooperation within production, updating and management of geodata as well as giving the users easy access to the data. A national geo-portal will be established to support the users to search, find, look at and download data coming from different sources and being physical stored in different technical environments. Thereby, the geo-portal will also serve as the main node for the Swedish cooperation in Europe according to the INSPIRE Directive.

National metadata catalogue

The strategic goal is to establish the necessary organisation, standards and technical solution in order to give the users easy access to information about available geodata, its quality and conditions for use.

Geodetic reference system

The strategic goal is that all actors who are building up, processing and using geodata shall use a common geodetic reference system and normally without any previous transformation. In Sweden a three-dimensional reference system with high accuracy has been adopted and is now being implemented. Lantmäteriet has already changed to this new system, which is directly related to the global and European reference systems, and is now supporting all other organisations in their changeover.

Research, development and education

The strategic goal for Sweden is to establish a more coherent research and development directed to support the development of the SDI. The R&D activities should emanate from helping to solve real problems and possibilities to cooperate internationally should be used.

Legal framework

The strategic goal is to develop a clear and distinct legal framework regulating the conditions for exchange and use of geodata. It should be based on a commonly accepted balance between the needs to protect important interests in society (such as security, vulnerability, integrity and copyright) and the users' needs of easy access to the actual information.

Financing and pricing

The strategic goal is to achieve benefits from a more efficient SDI with profits for all concerned parties, and to develop efficient models for financing and pricing.

Investments

During the period 2003–2006 investments relating to cartographic production have been of similar volume as during the last period. Most noticeable are the investments made in digital sensors for aerial photography replacing the old traditional cameras, in working stations for digital photogrammetry and in equipment for storage and distribution of geographic data.

Aerial Photography and the Production of Orthophotos

Aerial photography

Aerial photography is mainly carried out in order to meet the needs for aerial photos and orthophotos within the national mapping program, but at the same time the activities are planned with the goal to provide other users (municipalities, forestry companies, etc) with appropriate information. New aerial photos cover approximately 30 percent of Sweden every year.

New digital sensors are now introduced at Lantmäteriet, and two sensors will in 2007 replace the traditional aerial photographic cameras. The new sensors will simultaneously produce black/white, true colour and IRF data sets. They are furthermore the first step in a complete digital production line in the mapping process, ending in digital archives and in further dissemination.

In 2006 an area of 130,000 square km was covered in a mixture of black/white, colour and IRF products in an altitude of 4,600 m. 36 major cities were covered from an altitude of 2,000 m. The use of infrared film (IRF) has been gradually increased.

There is a national coverage of digital orthophotos with 1 m pixel size. In a number of larger cities the resolution is 0,3 metres.

Map Projection and Horizontal Reference System

The national map series are based on the Transverse Mercator projection (Gauss conformal pro-

jection) with the GRS 80 ellipsoid and is based on the national reference system SWEREF 99. The map projection is called SWEREF 99 TM.

The horizontal reference system for the new national grid is called SWEREF 99, the vertical RH 2000, and the reference system for gravitation is called RG 82. SWEREF 99 is globally adjusted to the EUREF specifications and is nationally adjusted to one single UTM zone. The replacement of the old RT 90 and the local systems being used by municipalities by SWEREF 99 will lead to a uniform reference system for all kinds of applications in the country. The replacement at Lantmäteriet took place in January 2007 and was made in all geographic databases and registers as well in the orthophoto production.

National Map Series

Lantmäteriet is responsible for the national mapping at scales of 1:10 000 and smaller. Besides, Lantmäteriet, is responsible for production of

property maps and cadastral index maps at large scales. The national map series are

The Property Map (Fastighetskartan)

is produced in the scale of 1:12,500 and is delivered as a print-on-demand product in order to give the customer the most updated information that exists. The map includes:

The orthophoto.

Boundaries, including property boundaries.

Names and register numbers of property units.

Place names.

Line enhanced planimetric details.

Arable land.

Contours at a 5 m interval.

The Topographic Map (Terrängkartan)

series consists of 244 sheets at 1:50,000. It covers the entire country except for some parts in the mountain areas in the northwest of Sweden. The Topographic map gives detailed information

Terrängkartan 1:50,000

